

### **REMARKS/ARGUMENTS**

Upon careful and complete consideration of the Office Action dated December 15, 2004, applicants have amended the claims which, when considered in conjunction with the comments herein below, are deemed to place the present application into condition for allowance. Favorable reconsideration of this application, as amended, is respectfully solicited.

With regards to the amendments made to the claims, applicants wish to note the following. Claim 1 has been amended to be specifically directed to the recovery of the deoxysugar fucose using a combination of steps (1) and (2), where step (1) comprises fractionation with a resin selected from weakly acid cation exchange resins and weakly basic anion exchange resins and step(2) comprises fractionation with strongly basic anion exchange resins and strongly acid cation exchange resins.

The claims have also been amended with respect to the expression “a solution derived from biomass”. Said phrase has been amended to read “a solution of a hydrolyzate of hemicellulose-containing biomass”. Basis for this amendment can be found, inter alia, on page 16 of the subject specification, fourth paragraph, second line.

Turning to the Office Action, claims 1, 8, 9, 27, 32, 39 and 40 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. More specifically, claims 1, 8, 9, 27 and 32 were rejected as it was alleged that the phrase “solution derived from biomass” found in said claims was indefinite. As noted above, the claims have been amended to more clearly define the starting material, i.e. a solution of a hydrolyzate of hemicellulose-containing biomass. It is respectfully submitted that said description as now claimed (and found

in the subject specification) is no longer indefinite and the rejection of these claims is respectfully requested to be withdrawn.

Claims 39 and 40 were rejected for lacking antecedent basis for the terms L-fucose and L-rhamnose. Claim 1 has been amended to include the antecedent basis for the term L-fucose, while claim 40 has been amended to be dependent on claim 4, said claim 4 containing the antecedent basis for the term L-rhamnose. Accordingly, it is respectfully requested that the rejection of claims 39 and 40 be withdrawn as well.

Claims 43-44 were objected to under 37 C.F.R. §1.75(c) as being in improper multiple dependent format. These claims have been deleted. Accordingly, the objection should be withdrawn.

The Office Action next rejected claims 1, 3, 4, 7, 10, 12, 14, 18, 19 and 40 under 35 U.S.C. §102(b) as allegedly anticipated by U.S. Patent No. 4,758,283 to Takemura et al. (hereinafter referred to as "Takemura et al."). The Office Action based the rejection of these claims based on its reading of Takemura et al. for teaching the production of L-rhamnose by hydrolyzing a biomass material, passing the hydrolyzate through a Na<sup>+</sup> cation exchange resin to isolate an L-rhamnose sugar fraction, desalting the fraction with multiple passes through a cation exchange resin and an ion exchange resin, evaporating and cooling the purified solution to crystallization with the assistance of ethanol.

The present invention as now claimed in the above-noted rejected claims has been specifically directed to the recovery of fucose using a process comprising a fractionation with a resin selected from weakly acid cation exchange resins and weakly basic anion exchange resins and a fractionation with strongly basic anion exchange resins and strongly acid cation exchange resins.

It is respectfully submitted that Takemura et al. does not disclose, teach or suggest the recovery of fucose. It is axiomatic that anticipation under Section 102 requires that the prior art reference disclose every element of the claim. In re King, 801 F.2d 1324, 1326, 231 U.S.P.Q. 136, 138 (Fed.Cir. 1986). Thus, there must be no differences between the subject matter of the claim and the disclosure of the prior art reference. Stated in another way, the reference must contain within its four corners adequate directions to practice the invention. The corollary of this rule is equally applicable. The absence from the reference of any claimed element negates anticipation. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571, 230 U.S.P.Q. 81, 84 (Fed.Cir. 1986).

Again, Takemura et al. does not teach or suggest the recovery of fucose as claimed by the present invention. Clearly, King and Kloster Speedsteel show that Takemura et al. fall short of the anticipation standard of 35 U.S.C. §102(b). Consequently, the rejection of the claims under 35 U.S.C. §102(b) based on Takemura et al. are respectfully requested to be withdrawn.

The Office Action next rejected claims 1-4, 6, 7, 10, 12, 14, 17, 18 and 20-22 under 35 U.S.C. §102(b) as allegedly anticipated by U.S. Patent No. 6,663,717 to Antila et al. (hereinafter referred to as "Antila et al.").

Antila et al. teach the recovery of pectic sugars (mainly arabinose, but including also rhamnose and fucose) by treatment with a  $\text{Ca}^{2+}$  cation exchange resin and a  $\text{Na}^{+}$  cation exchange resin to isolate the sugar fraction. The resins used by Antila et al. are strongly acid cation exchange resins. In all the chromatographic fractionations set forth in Examples 1, 2 and 5 of Antila et al., the separation resin is a sulphonated polystyrene-divinyl-benzene resin. The functional group in this resin is a sulphone group ( $-\text{SO}_3\text{H}$ ), which provides the properties of a strong acid to the resin. Thus, Antila et al. teaches the enrichment of a deoxy sugar product with

a two-step process, where both steps comprise a fractionation with a strongly acid cation exchange resin.

It is respectfully submitted that Antila et al. do not teach or suggest the fractionation process of the present invention which comprises fractionations with two different resin types, i.e. a weakly acid cation exchange resin or a weakly basic anion exchange resin in addition to the strongly acid cation exchange resin (or strongly basic anion exchange resin). This absence of a second different resin type from the cited reference clearly negates any anticipation rejection of the claims of the present invention based on Antila et al. Furthermore, it is stressed that Antila et al. is directed to the enrichment of pectic sugars from solutions containing sugar beet pectin and pectic sugars/oligomers, but not to the enrichment and recovery of fucose from solutions containing monosaccharides and deoxysugars. Specifically, Antila et al. do not teach or suggest the enrichment and recovery of fucose by the two-step process of the present invention.

Based on the above comments, and amendments to the claims, it is respectfully requested that the rejection of the claims under 35 U.S.C. §102(b) based on Antila et al. be withdrawn.

Claims 19, 37 and 38 were next rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Antila et al. in view of Takemura et al. It is respectfully submitted that these rejected claims ultimately depend from claim 1 and that the combined teachings of the cited references do not overcome the deficiencies identified above in responding to the anticipation rejections. Once again, the teachings of Antila et al. and Takemura et al., alone or in combination, do not teach or suggest the enrichment and recovery of fucose by the two-step process of the present invention. As such, the rejection of claims 19, 37 and 38 based on Antila et al. and Takemura et al. are respectfully requested to be withdrawn.

Claim 41 is next rejected under 35 U.S.C. §102(b) based on page 4306 of the Merck Index which teaches D-fucose as needle-shaped crystals melting at 144°C. It is noted that claim 41 has been amended to specifically be directed to L-fucose based on biomass, which has a melting point higher than 141°C and a purity higher than 99% on DS. The rejection of the Office Action is no longer relevant as it related to D-fucose. It is pointed out that the Merck Index teaches L-fucose having a melting point of 140°C, i.e. lower than that of the L-fucose as claimed in claim 41. As such, applicants respectfully request that the rejection of this claim be withdrawn.

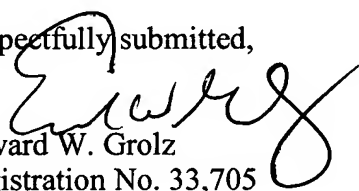
The Office Action next rejected claims 1, 6, 7 and 39 under 35 U.S.C. §102(b) as allegedly anticipated by Wong, C. et al., “Enzymatic Synthesis of L-Fructose and Analogs”, J. Org. Chem., 60:7360-7363 (1995) (hereinafter referred to as “Wong et al.”). Wong et al. teaches the recovery of L-fucose by treatment with a Ba<sup>2+</sup> cation exchange resin. However, Wong et al. do not teach, or suggest, the recovery of fucose by the two-step process in accordance with the present invention comprising fractionations with two different resins. Based on this absence of teaching from Wong et al., the anticipation rejection fails. Accordingly, it is respectfully requested that the rejection of claims 1, 6, 7, and 39 based on Wong et al. be withdrawn.

The Office Action lastly rejected claims 1-4, 7, 10, 12, 14-16, 18 and 19 under under 35 U.S.C. §102(b) as anticipated by WO 02/02739 to Xyrofin Oy (hereinafter referred to as “Xyrofin Oy”). Xyrofin Oy teaches the recovery of ramnose by treatment with a Na<sup>+</sup> strong acid cation exchange resin, a Na<sup>+</sup> weakly acid cation exchange resin and a Ca<sup>2+</sup> strong acid cation exchange resin. Xyrofin Oy does not teach or suggest the recovery of fucose in accordance with the present invention as now claimed. Consequently, the claimed present

invention cannot be seen as being anticipated by Xyrofin Oy and the rejection of the claims based on this reference are respectfully requested to be withdrawn.

Finally, it is further submitted that all the claims in the application as presently submitted contain patentable subject matter and a Notice of Allowance is earnestly solicited.

Respectfully submitted,

  
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